A., works an installation of 137 electric lights, for which he formerly used a steam engine; as a result he finds that he effects a saving of more than 50 per cent.

According to Lord Kelvin, wind still supplies a large part of the energy used by man. Out of 40,000 of the British shipping, 30,000 are sailing ships, and as coal gets scarcer "wind will do man's work on land, at least in proportion comparable to its present doing of work at sea, and windmills or wind motors will again be in the ascendant."

THE FRANKLIN KITE CLUB AND JAMES SWAIM.

In the American Journal of Science for 1837, Vol. XXXII, pp. 304–307, there is an article by James Swaim (b. 1816, d. 1877), describing some observations by himself, made October and November, 1836, for the purpose of determining daily the height of that layer of electrified air "whose positive electricity was concentrated enough to expand the leaves of the electrometer." Such measurements would of course determine the height of a layer having a constant difference of potential with regard to the earth's surface at the lower end of the wire. Mr. Swaim used a kite and apparatus which he describes as follows:

The preceding experiments were made with common three-stick kites, two feet six inches long and two feet four inches wide, tapering from the middle to the top. Wire No. 30 was used, which was wound on a reel four feet in circumference, having a glass axle running on a frame about three feet high, which was made in the same manner as the one used by the Franklin Kite Club of Philadelphia.

An electrometer was connected with an iron ring through which the wire passed, and which was suspended by means of silk in front of the reel for the purpose of preventing the wire from running off in winding up rapidly.

Also an instrument was used for finding the height of the kite, which I constructed in the following manner: Two stationary arms of different lengths were placed at right angles. The longer of these was graduated into small equidistant divisions. A movable arm, which was graduated in the same manner, was attached to the short arm, into which was let a level. This instrument was attached to the front of the reel stand by means of a screw, on which it could move.

The height of the kite was found by means of a simple proportion. Mr. Swaim also publishes the meteorological observations made by him at the surface of the earth, concerning which he says:

The dew-point was found from the following formula, discovered by Mr. Espy: Take two thermometers (Fahrenheit) that agree, or allow for the difference; cover one of the bulbs with a wet rag and suspend them in the shade where there is a draft of air, or fan them briskly until they become stationary. Then the difference of the thermometers being multiplied by one hundred and three, the product divided by the number of degrees indicated by the wet bulb, and the quotient subtracted from the number of those indicated by the dry one, will give the dew-point.

From the above we infer that wire was used both by the Franklin Kite Club before 1836, and by Mr. Swaim in that year. The "three-stick kites" described by him are sometimes called "house kites," and have the form of an irregular but symmetrical hexagon.

The reference to Espy's use of the "whirled psychrometer" is important as confirming the conclusion long since published by the Editor, that Espy was the first who practiced this use of the instrument.

KITES IN AMERICA AND EUROPE.

The active meteorologists of to-day with their abundance of scientific periodicals do not easily realize the difficulties under which our ancestors labored a century ago. Before the establishment of Silliman's American Journal of Science, 1818, and the Franklin Journal, or the Journal of the Franklin Institute by Dr. Jones in 1826, Americans necessarily looked to England and France for the records of the progress of science. The journals that were most widely circulated among us were Tilloch's Philosophical Magazine, Nicholson's Journal of Natural Philosophy, Phillip's Annals of Philosophy, Brewster's Edinburgh Journal of Science, and Young's Quarterly Journal of Science, and in these we must search, not only for American contributions, but also for the articles that stimulated American workers and the ideas that were prevalent among them. The modern application of the kite to meteorological work illustrates very prettily this interchange of ideas between Great Britain and America. Franklin and his electric kite of 1748 were but tales of the past when, in 1825, the memoir of Prof. Alexander Wilson (which had lain neglected for thirty-six years among the papers of his son, Prof. Patrick Wilson) was published in the Transactions of the Royal Society of Edinburgh, and almost at the same time was largely reprinted in Thomson's Annals of Philosophy for November, 1826 (apparently the last volume before the Annals were united with the Philosophical Magazine). An abstract of this paper was published as promptly as possible in the Franklin Journal for March, 1827, Vol. III, p. 182, and must have at once fallen into the hands of Espy, who was at that time studying meteorological matters. About this time, also, he must have read Fisher's article in the Quarterly Journal for 1826, and soon began his own experiments with kites. He must, also, have seen Harvey's article in the Encyclopedia Metropolitana in 1834, as that encyclopedia was widely circulated in the United States. Espy's theories as to atmospheric currents and storms, the temperature of the air, and the formation and heights of clouds, supported as they were by his own observations with kites and those of the Franklin Kite Club, excited much attention in Europe between 1835 and 1845. The discussions on his theories preceded, if they did not directly lead to, the attempt of Birt and Ronalds in 1847 at the Kew Observatory to determine the real condition of the atmosphere above us as to temperature and moisture. Their experiments were given up as unsatisfactory and the kite seems to have been abandoned—if I may except some observations of my own in 1867 at Washington and 1876 at Atlantic City and those of Van Rysselbergh in Belgium in 1880—until Archibald began his valuable work in England in November, 1883. The scanty use made of the kite during this interval resulted very largely from the fact that the balloon had absorbed attention and, indeed, seemed at first to offer all the facilities needed for the exploration of the upper air. Afterwards balloon work was supplemented by the establishment of mountain stations, beginning with Mount Washington, 1870, and Pikes Peak, 1873. But the progress of dynamic meteorology had shown the need of regular observations from stations that are more perfectly isolated from terrestrial influences than is possible on a mountain top. The Eifel tower seemed to perfectly respond to our needs, but such towers are expensive and rare. A few isolated investigations by no means respond to the needs of dynamic meteorology. The work done with balloons, kites, and mountain stations was reviewed in my lectures of 1882–85, showing that we must have maps of the upper isobars, isotherms, and winds and, to this end, must increase the number of our mountain stations and stimulate the use of balloons. In June, 1885, Mr. McAdie used kites to study atmospheric electricity at Blue Hill in extension of his studies under Professor Trowbridge at Cambridge. In my official estimates of July, 1885, and September, 1886, respectively, I included "kites, wire, reels, and sextant for the study of wind pressure" and, again, "kites, etc., for the study of temperature and wind at moderate elevations," as supplementary to balloons and mountain stations. But the important stimulus was given to this kite work by Eddy at Bayonne, N. J., in 1890, and just at this opportune moment Hargarve, in 1893, at Sydney, Australia, contributed to the progress of science his unique and valuable cellular kite, a full account of which was read at the Columbian Exposition, Chicago, 1893. Since then Eddy's work has been carried forward at Blue Hill by Mr. Rotch and his assistants, while